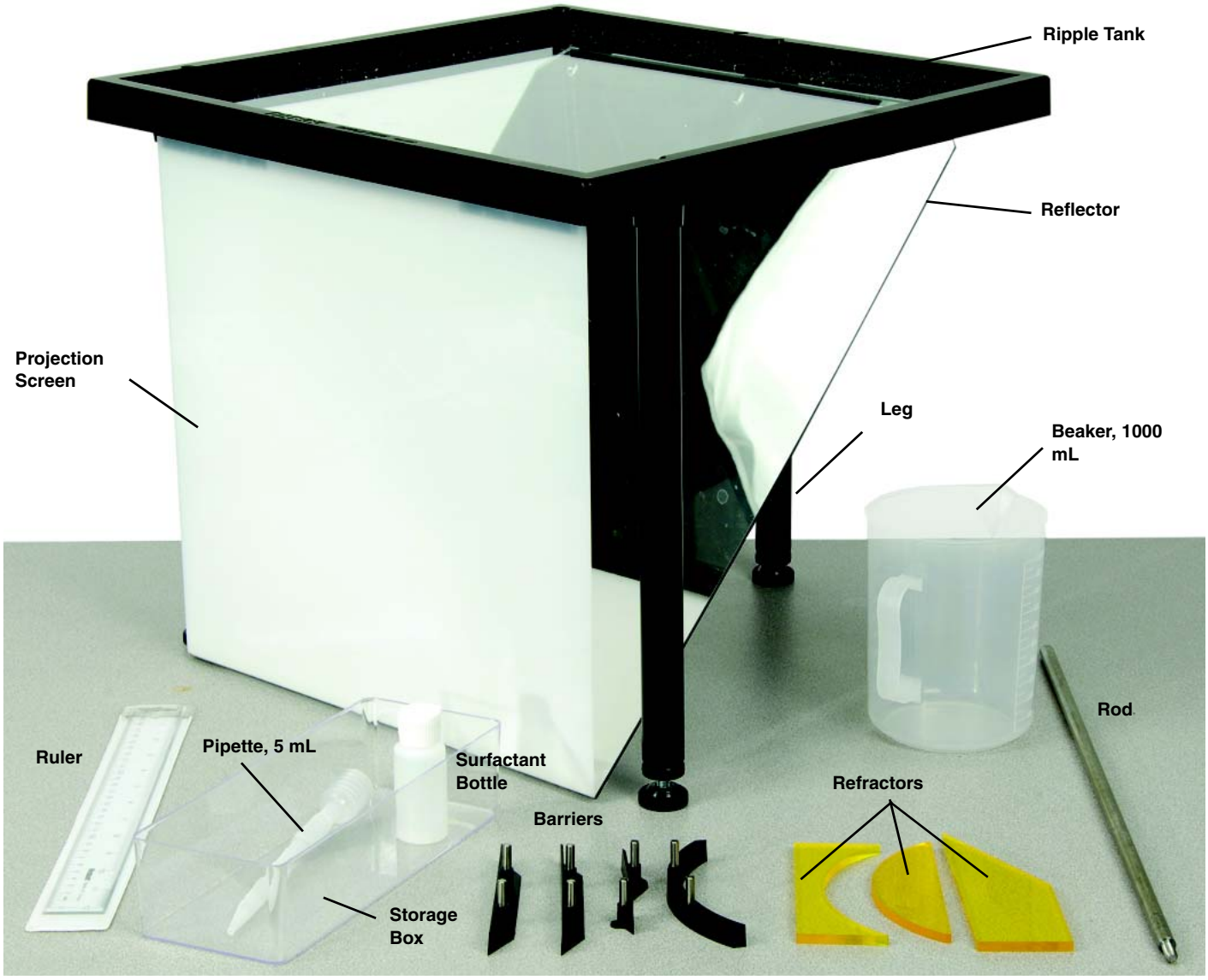
Ripple Tank

WA-9897



Introduction

The PASCO model WA-9897 Ripple Tank is designed to be used with the PASCO model WA-9896 Ripple Generator and Light Source. The tank is 42.5 cm by 42.5 cm by 2.5 cm with four foam "beaches" and a 0.3 cm thick glass plate. The viewing area is 33 cm by 33 cm. The tank has an easy-to-use drain pipe consisting of a piece of flexible vinyl plastic tubing and a tube clamp. The tank is supported by three detachable legs with adjustable feet and comes with a reflector and projection screen.

The ripple tank also comes with the following: ruler, pipette, surfactant bottle, storage box, barriers (5 pieces), refractors (3 pieces), a beaker, and a rod for supporting a light source. The list of included parts is given below.

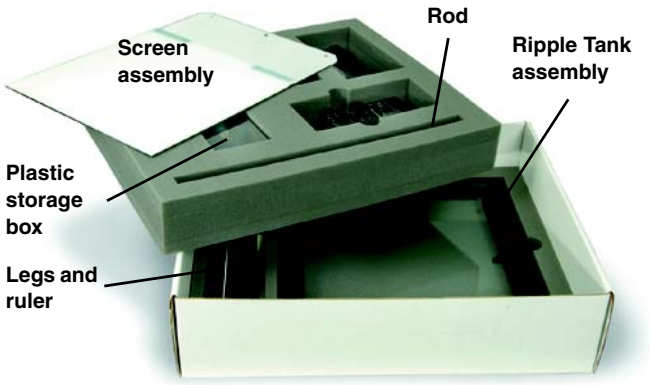
Items

Description	Part Number
1. Ruler	699-081
2. Pipette, 5 mL	699-154
3. Storage box	740-177
4. Bottle, 1 ounce, (for Tergitol surfactant[1])	650-072
5. Long barrier (2 pieces)	648-09718
6. Mini barrier	648-09717
7. Short barrier	648-09719
8. Curved reflector	648-09820
9. Concave refractor	648-09720
10. Convex refractor	648-09721
11. Trapezoidal refractor	648-09714
12. Rod for Light Source	648-09713
13. Leg, Ripple Tank	648-09705
14. Beaker, 1000 mL	699-197
15. Screen assembly	003-09736
16. Ripple Tank assembly	003-09703

[1] Note: The Tergitol L-62 surfactant is part number 699-023.

Descriptions

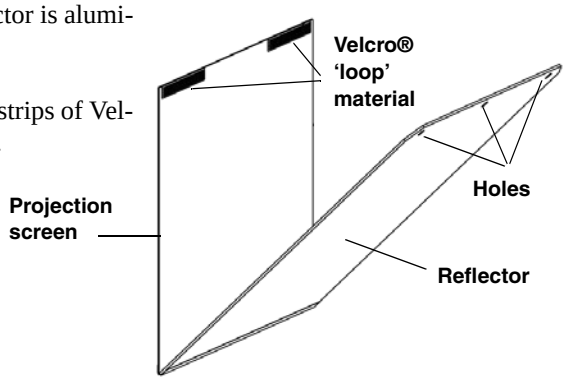
The box in which the Ripple Tank is stored has two layers. The screen assembly, plastic storage box, rod, and beaker are in the top layer, and the ruler, legs, and Ripple Tank assembly are in the bottom layer. The top layer has areas for storing the WA-9896 Ripple Generator and Light Source, including the power adapter and cord.



Screen Assembly

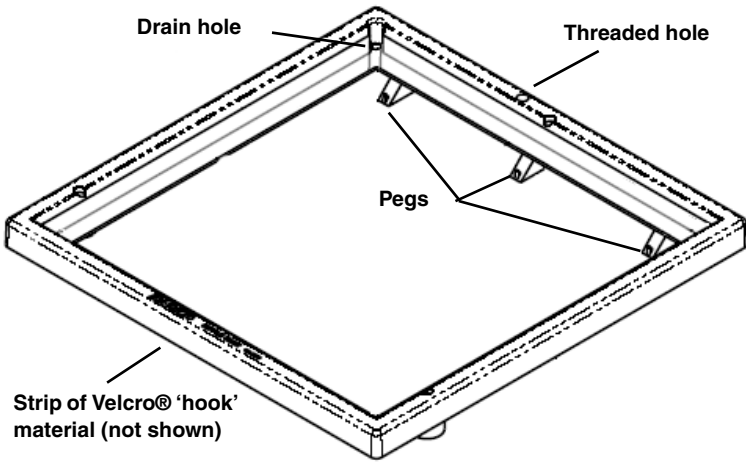
The screen assembly is a reflector and a projection screen joined at one edge by a strip of flexible tape. Note: Remove any protective coating from the reflector and the screen before using. The reflector is aluminized acrylic. The screen is translucent plastic.

There are three holes along the top edge of the reflector and two strips of Velcro® 'loop' material along the top edge of the projection screen.

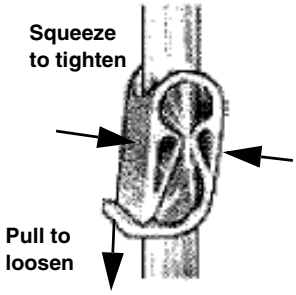


Ripple Tank Assembly

The ripple tank assembly has an impact resistant plastic frame. Below the front edge of the frame is a strip of Velcro® 'hook' material that will hold the 'loop' material on the top edge of the projector screen. Below the back edge of the frame are three pegs that fit into the holes in the top edge of the reflector. The threaded hole on the top side of the back edge is for the rod that can support the Light Source that is included in the WA-9896 Ripple Generator and Light Source. When the ripple tank is in use, the four foam 'beaches' dampen the waves that would otherwise reflect and disturb the primary wave and interference patterns. The foam beaches are replaceable. (A variety of replacement parts are available in the WA-9898 Ripple Tank Replacement Set.)



The ripple tank's drain pipe is a piece of flexible vinyl tubing attached below the drain hole at the back corner of the tank. Squeeze the sides ot the tube clamp on the drain pipe to tighten the clamp on the tubing. Pull downward on the lip of the tube clamp to loosen the clamp.



Setup

To setup the ripple tank, screw the legs into the threaded holes on the underside near the two front corners of the tank, and under the midpoint of the back edge. Place the ripple tank on a smooth, level surface.

To attach the reflector and projection screen to the tank, unfold the screen assembly and put the reflector between the two front legs. Angle the reflector upwards and guide the top edge so that the three holes fit over the pegs that are at the back edge of the tank. Next, raise the projection screen to the vertical position and attach its Velcro® 'loop' material to the strip of 'hook' material under the front edge of the tank.

Apply Surfactant Before putting water into the ripple tank for the first time, prepare the foam beaches, barriers, and refractors with a drop of surfactant (a nonionic wetting agent). The surfactant helps to avoid problems with the surface tension of the water. Put a single drop of surfactant from the small plastic bottle onto the end of one finger, and lightly rub your finger along the foam beaches. Use a single drop of surfactant to very sparingly coat the large flat surfaces of the three refractors and the front surfaces of the straight and curved barriers. Note that you only need to apply surfactant to the beaches, barriers, and refractors before using the ripple tank for the first time, or if the equipment has been unused for a long time.

Level the Ripple Tank When you are ready to add water to the tank, squeeze the sides of the tube clamp to close the clamp. Use the beaker to add a small amount of water to the middle of the tank so that the water forms a circle about 10 cm in diameter. Adjust the feet on the legs until the circle of water stays in the middle of the tank and does not move toward any side. (An alternate method for leveling the tank is to add about 800 milliliters of water to the tank. Measure the water depth at three of the four corners of the tank and adjust the feet on the legs until the depths are the same.)

Dampen the Foam Beaches To reduce the problem of surface tension, let the foam beaches soak up some of the water. After putting about 800 milliliters of water in the tank, press down on the foam and then release the pressure so that water enters the pores of the foam rubber.

Cleanup

Before emptying the tank, remove the projection screen and reflector. Fold the screen assembly so the projection screen protects the reflector.

To empty the tank, place a container under the drain pipe and open the tube clamp. When the water stops flowing, raise the corner of the tank opposite to the drain hole so the rest of the water will drain out. Leave the tube clamp in the open position.

Be careful to get as much water out of the foam beaches as possible. Press with your thumbs against the foam to squeeze the water out. Next, press a rolled-up towel onto the foam beaches to soak up any remaining water.

Dry the glass plate completely so that water spots won't form on the plate. To clean the glass plate or the reflector, use a soft cloth moistened with water and then dry with a clean towel. Do not use soap or chemical cleaners.

Technical Support

For assistance with any PASCO product, contact PASCO at:

Address:	PASCO scientific 10101 Foothills Blvd. Roseville, CA 95747-7100
Phone:	916-786-3800 (worldwide) 800-772-8700 (U.S.)
Fax:	(916) 786-7565
Web:	www.pasco.com
Email:	support@pasco.com

Limited Warranty
For a description of the product warranty, see the PASCO catalog.

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Material Safety Data Sheet
The Dow Chemical Company

Product Name: TERGITOL(TM) L-62

Issue Date: 01/26/2006
Print Date: 15 Aug 2007

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
TERGITOL(TM) L-62

COMPANY IDENTIFICATION
The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
USA

Customer Information Number: 800-258-2436

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 989-636-4400

2. Hazards Identification

Emergency Overview
Color: Clear
Physical State: Liquid
Odor: Mild
Hazards of product:

No significant immediate hazards for emergency response are known.

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects
Eye Contact: May cause slight temporary eye irritation. Corneal injury is unlikely.
Skin Contact: Prolonged exposure not likely to cause significant skin irritation. Material may be handled at elevated temperatures; contact with heated material may cause thermal burns.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Inhalation: At room temperature, exposure to vapor is minimal due to low volatility; single exposure is not likely to be hazardous. Vapor from heated material or mist may cause respiratory irritation.

* Indicates a Trademark

Ingestion: Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause injury.
Effects of Repeated Exposure: For similar material(s): In animals, effects have been reported on the following organs after exposure to aerosols: Lung.

3. Composition Information

Component	CAS #	Amount
Polyalkylene glycol	9003-11-6	<= 99.0 %

4. First-aid measures

Eye Contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.
Skin Contact: Wash skin with plenty of water.
Inhalation: Move person to fresh air; if effects occur, consult a physician.
Ingestion: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.
Notes to Physician: If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Extinguishing Media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Do not use direct water stream. May spread fire. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.
Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.
Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.

6. Accidental Release Measures

Steps to be Taken if Material is Released or Spilled: Contain spilled material if possible. Absorb with materials such as: Sand. Dirt. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

Personal Precautions: Keep unnecessary and unprotected personnel from entering the area. Spilled material may cause a slipping hazard. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.
Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. Handling and Storage

Handling
General Handling: Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. Product on surfaces can cause slippery conditions. Product shipped/handled hot can cause thermal burns. Product handled hot may require additional ventilation or local exhaust.

Storage
Keep container tightly closed when not in use. Store in the following material(s): Stainless steel. Polypropylene. Polyethylene-lined container. Teflon. Glass-lined container. Aluminum. Plasite 3066 lined container. Plasite 3070 lined container. 316 stainless steel.

Shelf life: Use within	**Storage temperature:**
24 Months	15 - 35 °C

8. Exposure Controls / Personal Protection

Exposure Limits

None established

Personal Protection
Eye/Face Protection: Use safety glasses.
Skin Protection: No precautions other than clean body-covering clothing should be needed. When handling hot material, protect skin from thermal burns. Selection of specific items will depend on the operation.

Hand protection: Use gloves with insulation for thermal protection, when needed.
Respiratory Protection: For most conditions, no respiratory protection should be needed; however, if material is heated or sprayed, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.
Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls
Ventilation: Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Physical State	Liquid
Color	Clear
Odor	Mild
Flash Point - Closed Cup	216 °C (421 °F) *ASTM D93*
Flammable Limits In Air	**Lower**: No test data available **Upper**: No test data available
Autoignition Temperature	No test data available
Vapor Pressure	No test data available
Boiling Point (760 mmHg)	*Not applicable* decomposes before boiling.

Vapor Density (air = 1)	>1 *Literature*
Specific Gravity (H2O = 1)	1.011 *Calculated*
Freezing Point	See Pour Point
Melting Point	not applicable to liquids
Solubility in Water (by weight)	readily soluble
pH	6.5 *Calculated* (3% aq.sol)
Molecular Weight	2500 g/mol *Calculated*
Kinematic Viscosity	231 cSt @ 38 °C *Calculated*
Cloud point	30 °C *Calculated* (1% aqueous solution)
Pour point	-2 °C (28 °F) *Calculated*

10. Stability and Reactivity

Stability/Instability
Thermally stable at typical use temperatures.
Conditions to Avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous Polymerization
Will not occur.

Thermal Decomposition
Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Alcohols. Ethers. Hydrocarbons. Ketones. Organic acids. Polymer fragments.

11. Toxicological Information

Acute Toxicity
Ingestion
Typical for this family of materials. Estimated LD50, Rat > 4,000 mg/kg
Skin Absorption
Typical for this family of materials. LD50, Rabbit > 10,000 mg/kg
Repeated Dose Toxicity
For similar material(s): In animals, effects have been reported on the following organs after exposure to aerosols: Lung.

12. Ecological Information

CHEMICAL FATE

Persistence and Degradability
For this family of materials: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.
OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
> 60 %	28 d	OECD 301F Test

ECOTOXICITY
For this family of materials: Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50 >100 mg/L in the most sensitive species tested).

13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. DOW HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Recycler. Reclaimer. Incinerator or other thermal destruction device. As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Group at 1-800-258-2436 or 1-989-832-1556 (U.S.), or 1-800-331-6451 (Canada) for further details.

14. Transport Information

DOT Non-Bulk
NOT REGULATED

DOT Bulk
NOT REGULATED

IMDG
NOT REGULATED

ICAO/IATA
NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	No
Delayed (Chronic) Health Hazard	Yes
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Section 103
This product contains the following substances which are subject to CERCLA Section 103 reporting requirements and which are listed in 40 CFR 302.4.

Component	CAS #	Amount
Ethylene oxide	75-21-8	<= 10.0 PPM
Propylene oxide	75-56-9	<= 10.0 PPM
1,4-Dioxane	123-91-1	<= 5.0 PPM
Acetaldehyde	75-07-0	<= 5.0 PPM
Formaldehyde	50-00-0	<= 5.0 PPM

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
WARNING: This product contains a chemical(s) known to the State of California to cause cancer.

Component	CAS #	Amount
Ethylene oxide	75-21-8	<= 10.0 PPM
Propylene oxide	75-56-9	<= 10.0 PPM
1,4-Dioxane	123-91-1	<= 5.0 PPM
Acetaldehyde	75-07-0	<= 5.0 PPM
Formaldehyde	50-00-0	<= 5.0 PPM

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
WARNING: This product contains a chemical(s) known to the State of California to cause birth defects or other reproductive harm.

Component	CAS #	Amount
Ethylene oxide	75-21-8	<= 10.0 PPM

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30
CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.
European Inventory of Existing Commercial Chemical Substances (EINECS)
The components of this product are on the EINECS inventory or are exempt from inventory requirements.

16. Other Information

Product Literature

Additional information on this and other Dow products may be obtained by visiting our web page at www.dow.com. Additional information on this product may be obtained by calling your Dow Chemical Company sales or customer service contact. Ask for a product brochure.

Hazard Rating System

NFPA	Health	Fire	Reactivity
	1	1	1

Recommended Uses and Restrictions

Multi-purpose surfactant.

Revision

Identification Number: 80110 / 1001 / Issue Date 01/26/2006 / Version: 2.1
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that its activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.